R E P O R T R E S U M E S

ED 003 190 56

LEVEL OF ACHIEVEMENT, RETENTION, AND TRANSFER OF TRAINING IN SPELLING AS A FUNCTION OF MODE OF PRESENTATION.

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REPORT NUMBER NDEA-VIIA-1024 PUB DATE JUN 64
STATE UNIV. OF N.Y., CORTLAND
GRANT OEG-7-48-0070-194
EDRS PRICE MF-$0.18 HC-$2.40 60P.

DESCRIPTORS- *SPELLING, *TEACHING METHODS, INSTRUCTION, *PROGRAMED INSTRUCTION, *ELEMENTARY SCHOOL STUDENTS, GRADE 2, GRADE 4, *ABILITY, ACHIEVEMENT, RETENTION, TRANSFER OF TRAINING, LEWISBURG, PENNSYLVANIA, CORTLAND, NEW YORK

THE EFFECTS OF AUDIO, PRINT, AND AUDIOPRINT MODES OF PROGRAMED SPELLING INSTRUCTION WERE COMPARED. RELATIONSHIPS AMONG THESE MODES AND SPELLING ACHIEVEMENT, RETENTION, AND TRANSFER WHERE OBTAINED. ALSO INCLUDED IN THE STUDY WERE PUPIL PREFERENCES FOR PROGRAMED INSTRUCTION AS CONTRASTED WITH TEACHER-PRESENTED INSTRUCTION. APPROXIMATELY 60 SECOND-GRADE AND 60 FOURTH-GRADE STUDENTS RECEIVED PROGRAMED INSTRUCTION ON WORDS PREVIOUSLY MISSPELLED. ALL GROUP MEMBERS RECEIVED INSTRUCTION WITH THREE INSTRUCTION MODES. VARIATIONS IN LEVELS OF WORD DIFFICULTY, LENGTH OF INSTRUCTION, INDIVIDUAL DIFFERENCES, AND TEACHERS WERE CONTROLLED VARIABLES. THE WORDS WERE GENERATED FROM UNPUBLISHED SPELLING PROGRAMS FOR THE THIRD AND SIXTH GRADES. POST-TEST ACHIEVEMENT SCORES, RETENTION, AND TRANSFER SCORES (ORAL AND DELAYED) WERE OBTAINED WITH SPECIALLY CONSTRUCTED TESTS. MODE PREFERENCES WERE OBTAINED FROM AN INSTRUMENT WHICH PRESENTED ALL POSSIBLE COMBINATIONS. THIRTY-TWO ANALYSES OF VARIANCE WERE PERFORMED. NO SUPPORT WAS FOUND FOR THE SUPERIORITY OF ANY MODE OF PROGRAMED INSTRUCTION IN EITHER ACHIEVEMENT, RETENTION, OR TRANSFER. INDIVIDUAL RELATIONSHIPS WERE SUGGESTED AMONG INTELLIGENCE, READING COMPREHENSION, RELATIVE ACHIEVEMENT, AND MODE OF PRESENTATION. NO SUBJECTS PREFERRED THE PRINT MODE. THE AUDIOPRINT MODE WAS PREFERRED OVER ALL PROGRAMED INSTRUCTION MODES. (WN)

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A FINAL REPORT

OE Grant No.

7-48-0070-194

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INTRODUCTION

I. The Problem

Although lack of student interest in spelling may be exaggerated, there is little doubt that spelling is not listed among the more popular academic subjects. According to Horn (1960) this lack of interest on the part of the students could be the result of teachers' attitudes toward spelling. Horn reports that spelling is one of the subjects teachers most dislike to teach.

Because of the teachers' attitudes toward spelling, it may be desirable to use a teaching method that involves the teacher only to a limited degree. Moore and Smith (1961) and Porter (1961) suggest that self-instructional materials in spelling could release the instructor, in part, from teaching spelling. At the very least, programmed spelling might give the teacher freedom to concentrate on those aspects of learning to spell that need the most attention. In addition to release of the teachers' time, programmed spelling could provide for individual differences and increase the motivation of the students. Since the range of spelling ability and achievement of students in any grade is large (Horn, 1960), pre-tests, branching and self-paced materials would provide for the needs of individuals. Some motivation may be secured from the novelty of using teaching machines and from well-organized learning programs. Also, the learning programs should help in maintaining interest through immediate confirmation or knowledge of results (Carr, 1962).

However, to date, all commercially available spelling programs, many experimental versions of spelling programs, and practically all known spelling series are in printed form. Even though the research of Gates, 1926 and others would seem to indicate that the mode of sensory presentation should be predominantly visual, auditory imagery which attends to both the pronunciation and writing of spelling words increases the effectiveness of learning (Anderson, 1951; Horn, 1960). Sound perception and discrimination are significantly related to spelling ability (Templin, 1954) as is visual memory, visual discrimination and visual perception (Gates, 1926; Hudson, 1949; Russell, 1943). There also is evidence that some individuals function more effectively when the material is presented through one sensory modality than when it is presented through another (Kay, 1958; Woodworth and Schlosberg, 1954).

Hartman proposes that "Redundant information simultaneously presented by audio and print channels is more effective in producing learning than is the same information in either channel alone." (1961,a,p. 25). In a comparative effectiveness study of the several combinations of print, audio, and pictorial stimuli, Hartman found that audio-print combinations tend to produce the highest achievement on single channel tests and he concludes that,

> "...learning of simultaneous information presented over multiple channels follows a stimulus generalization model with respect to the relation between the number of channels in the presentation condition and the number of channels in the testing conditions. The

> general expectation is that multiple channel presentations do not produce increases in learning over single channel presentations unless the situation in which the learning is elicited also contains the additional cues." (p.31)

By combining programmed spelling in audio-taped form with the same material in print form, it seems probable that achievement will be higher than for either form alone, particularly if the testing conditions include both audio and print channels. In a review of single versus multiple channel presentation, Hartman (1961,b) reports that when information is presented simultaneously in audio and print forms, "It is apparent that a simultaneous audio-print presentation is more effective than either audio or print alone when the information simultaneously presented is redundant." (pp. 243-244).

The purpose of this study was a comparison of the effectiveness of a two channel (audio-print) presentation of spelling material with a single channel presentation (print only or audio only) of spelling material.

The specific hypotheses of the study were

1. Simultaneous presentation of redundant information through audio and print channels will result in higher <u>group</u> achievement on both audio and print achievement tests than will the presentation of information through a single channel, print only or audio only.
2. The audio presentation alone will result in higher achievement than the print presentation alone for children in the

second grade while the converse will be true for children in the fourth grade. (Hartman, 1961b).

3. Retention of the material learned will be highest for the material presented simultaneously in audio and print form; it will be lowest for second grade children on the print form and for fourth grade children on the audio form.
4. Transfer of training to the spelling of new words will be greater for principles taught via multiple channel presentation than for principles taught via single channel presentation.

METHOD

Subjects:

Two classes of second grade (N=52) and two classes of fourth grade (N=57) public school pupils participated in this study.[1] To reduce the effects of pupil and teacher variability, Ss were stratified by sex and randomly assigned to one of the two experimental groups for each grade level. Students were told that a part of their spelling grade would be based on their achievement on the programmed materials.

Apparatus and Materials:

A Thermofax Model 60 Portable Overhead Projector was used to project the programmed spelling on a Radiant 70" x 70" beaded screen.

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[1]The study took place in the White Deer Elementary School, Milton Area Schools, White Deer, Pa.

The printed material in programmed form was placed on transparencies for visual presentation. Since the number of frames per page varied from five to eight, a mask was used to permit the exposure of a single frame at a time. The image size of the projected frames was well within the size recommended by the Minnesota Mining and Manufacturing Company for screen size and maximum viewing distance. The screen was placed at the front of the classroom and the operator was seated on the floor so that the vision of Ss was not blocked. Before beginning the experiment, those Ss who had difficulty in reading sample frames were moved to the front of the room.

The content of the printed form of the program was recorded on audio-tape by a person experienced in presenting spelling material orally.[2]

Procedure:

All Ss utilized programmed spelling materials. The experimental period consisted of four weeks during which each S was required to learn sixty words. The sixty words required 397 frames in the second grade program and 435 frames in the fourth grade program. Twenty words were taught each S by each of three methods of presentation (audio, print, audio-print). The programmed material was presented three times a week for a thirty-minute period. During each of these thirty-minute periods, five words grouped according to a phonetic concept*were taught.

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[2]Dr. Ralph Rees, Department of English, Bucknell University, Lewisburg, Pa.

*A list of the words by group is given in Appendix A.

Before the experiment began, Ss were taught five practice words using each of the three modes to familiarize them with the procedure.

During the first week, Group I received the first five words by audio in Session 1, the next five words by print in Session 2, followed by five more words by audio-print in Session 3. A five-word presentation required responses to approximately 35 frames during each thirty-minute session.

In the audio version a teaching frame was presented, a 10 second period of silence was provided for Ss to write a response, then the answer was presented. Timing of the material for the audio version was done with a triple-stopwatch timing board. In the print version of the program, each frame was exposed for the same length of time as it was for the audio version. Since the time intervals were identical it was possible to present the audio and the print versions in combination. During the audio-print presentation, Ss read the frame on the screen while listening to the frame on the tape, then wrote a response. A Wollensak Model T1500 tape recorder was used both for recording and presenting the audio program. During the three modes of presentation Ss used a piece of cardboard to cover their answers to prevent the copying of previous responses.

During the first week Group II received the same treatment as Group I with the exception that the first five spelling words were presented by print, the second five spelling words by audio, and the third group of five spelling words by audio-print.

During the second, third, and fourth weeks the procedure was the same as during the first week with the exception that the order

of mode of presentation was varied according to a partial Latin square design. This experimental design made it possible to compare each individual with himself as a function of presentation mode.

The spelling words used were drawn from two unpublished spelling programs,[4] one for the third-grade and one for the sixth-grade. Third-grade and sixth-grade words were used for the second grade and fourth grades respectively to provide a list of words of high difficulty.

A spelling pre-test of 179 words was given to the Ss in the second grade while a pre-test of 197 words was given to the Ss in the fourth grade. Only those words which at least 80 per cent of Ss were unable to spell were considered for use in the experiment. Sixty of the words most often misspelled were grouped according to 12 different phonetic principles for each grade level. (See Appendix A). The groups of words were randomly assigned to one of the three modes of presentation (audio, print, or audio-print). Although the words were grouped by phonetic principles, the program did not include frames to teach the principles per se.

A spelling achievement test consisting of the 60 words for each grade level was constructed. The test consisted of twenty words which were presented by audio, twenty words which were presented by print, and twenty words which were presented by audio-print. Ten of the twenty words in the test for each of the three

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[4]The programs were prepared by Mary Haupt Smith, Susquehanna Valley Program, Bucknell University.

modes of presentation were presented orally and ten words were presented visually. The words were randomly assigned to one of the two tests. (See Appendix B).

A 36-word oral transfer test was constructed for each grade level. As with the achievement test, a pre-test was given and only those words which were misspelled by at least 80 per cent of the students were used. None of the transfer words was included in the program but it was hypothesized that the words in the transfer test would be spelled correctly if Ss generalized from the phonetic principles used in grouping words for the program. Three words representing each of the twelve concepts utilized in grouping words for the program were used in the transfer test. (See Appendix C).

The achievement test and the transfer test were given at the end of the experiment and again one month later. In addition, Ss were asked to indicate whether they preferred learning to spell through the audio, the print, or the audio-print mode or whether they preferred to learn from a teacher. The four modes of instruction were paired in all possible combinations and Ss were forced to choose one member of each pair.

Since the procedure did not require teacher participation, the teacher variable was brought under control in this design. The amount of time allotted for reading and/or listening to the frames was controlled by presenting the frames on tape and on transparencies with equal time intervals. Individual differences were controlled since each S served as his own control and each S was compared to himself as a function of the teaching method (treatment subjects design). Since Group I received the audio

version followed by the print version, and Group II received the print version followed by the audio version, the order of presentation controlled for two of the modes (audio and print), and the third mode (audio-print) was partially controlled. Variation in level of difficulty of the words was controlled since one group was taught five words through the audio mode while the other group was taught the same words through the print mode.

II. RESULTS

Mode of Presentation: Achievement, Retention, Transfer of Training.

To compare the effects of mode of presentation, audio, print, or audio-print, on achievement for the second and fourth-grade Ss, a single classification analysis of variance was applied to the data. Since two forms, print and oral, of the final test were administered to determine the influence of the testing procedure on achievement, three analyses of variance were completed for each group in each grade comparing means of the groups on the (1) oral achievement test, (2) print achievement test, and (3) the combined scores on the oral and print achievement tests. Tables I, II, and III summarize the analyses of these data for Ss in the second grade. Tables IV, V, and VI summarize the analyses of these data for Ss in the fourth grade.

TABLE I

Analysis of Variance for Oral Achievement as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	81.03	2	40.52	4.607	$< .05$
Within	606.92	69	8.796		

Group II

Source	S.S.	df	M.S.	F	P
Between	41.70	2	20.85	2.361	n.s.
Within	609.42	69	8.832		

TABLE II

Analysis of Variance for Written Achievement as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	19.00	2	9.50	1.330	n.s.
Within	492.87	69	7.14		

Group II

Source	S.S.	df	M.S.	F	P
Between	13.78	2	6.89	0.798	n.s.
Within	595.54	69	8.63		

TABLE III

Analysis of Variance for Combined Oral and Written Achievement as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	0.848	2	0.424	0.021	n.s.
Within	1250.683	63	19.852		

Group II

Source	S.S.	df	M.S.	F	P
Between	9.848	2	4.924	0.121	n.s.
Within	2572.592	63	40.835		

TABLE IV

Analysis of Variance for Oral Achievement as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	1.81	2	0.91	0.129	n.s.
Within	359.17	51	7.04		

Group II

Source	S.S.	df	M.S.	F	P
Between	1.14	2	0.57	0.094	n.s.
Within	362.29	60	6.038		

TABLE V

Analysis of Variance for Written Achievement as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	4.92	2	2.46	0.791	n.s.
Within	158.56	51	3.11		

Group II

Source	S.S.	df	M.S.	F	P
Between	4.67	2	2.34	0.713	n.s.
Within	196.76	60	3.28		

TABLE VI

Analysis of Variance for Combined Oral and Written Achievement as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	1.037	2	0.518	0.035	n.s.
Within	754.445	51	14.793		

Group II

Source	S.S.	df	M.S.	F	P
Between	3.175	2	1.588	0.098	n.s.
Within	977.143	60	16.286		

Achievement was not affected in either grade by mode of instruction except for Grade II, Group I (Table I) in which the order of presentation began with the audio mode and in which oral achievement on the material learned via this mode was significantly higher than the oral achievement for material learned via the print or the audio-print modes.

To compare the effects of the three modes of instruction on retention, analyses of the retention test scores were completed in the same form as for the achievement test data. These analyses for the second grade are summarized in Tables VII, VIII, and IX and for the fourth grade in Tables X, XI, and XII.

TABLE VII

Analysis of Variance for Oral Retention as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	34.33	2	17.17	2.172	n.s.
Within	403.00	51	7.902		

Group II

Source	S.S.	df	M.S.	F	P
Between	7.60	2	3.80	0.493	n.s.
Within	439.00	57	7.702		

TABLE VIII

Analysis of Variance for Written Retention as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	2.182	2	1.091	1.122	n.s.
Within	49.562	51	0.972		

Group II

Source	S.S.	df	M.S.	F	P
Between	8.40	2	4.20	0.441	n.s.
Within	542.45	57	9.517		

TABLE IX

Analysis of Variance for Combined Oral and Written Retention as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	76.334	2	38.187	1.539	n.s.
Within	1264.500	51	24.794		

Group II

Source	S.S.	df	M.S.	F	P
Between	30.400	2	15.200	0.480	n.s.
Within	1804.850	57	31.664		

TABLE X

Analysis of Variance for Oral Retention as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	4.33	2	2.065	0.324	n.s.
Within	340.50	51	6.676		

Group II

Source	S.S.	df	M.S.	F	P
Between	3.93	2	1.965	0.432	n.s.
Within	272.67	60	4.544		

TABLE XI

Analysis of Variance for Written Retention as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	3.59	2	1.795	0.840	n.s.
Within	109.00	51	2.137		

Group II

Source	S.S.	df	M.S.	F	P
Between	1.14	2	0.57	0.158	n.s.
Within	216.86	60	3.61		

TABLE XII

Analysis of Variance for Combined Oral and Written Retention as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	2.764	2	1.382	0.101	n.s.
Within	699.106	51	13.708		

Group II

Source	S.S.	df	M.S.	F	P
Between	2.380	2	1.190	0.089	n.s.
Within	803.049	60	13.384		

Retention was unaffected by mode of presentation in either grade as is evidenced in Tables VII - XII.

Analyses of variance were completed for each group in each grade on the scores obtained from the test of delayed transfer of training. Summaries of these analyses are presented for the second grade in Table XIII and for the fourth grade in Table XIV. A significant difference in performance was found only for Group II of the second grade. Analyses also were completed for each group in each grade on scores obtained from an oral test for transfer of training. No differences were found in oral transfer in either grade as is evidenced in Table XV and Table XVI.

TABLE XIII

Analysis of Variance for Delayed Transfer of Training as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	2.308	2	1.154	1.973	n.s.
Within	31.605	54	0.585		

Group II

Source	S.S.	df	M.S.	F	P
Between	7.903	2	3.952	6.631	<.01
Within	35.739	60	0.596		

TABLE XIV

Analysis of Variance for Delayed Transfer of Training as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	0.576	2	0.288	0.515	n.s.
Within	28.493	51	0.559		

Group II

Source	S.S.	df	M.S.	F	P
Between	1.185	2	0.593	0.966	n.s.
Within	36.829	60	0.614		

TABLE XV

Analysis of Variance for Oral Transfer of Training as a Function of Mode of Presentation - Grade II

Group I

Source	S.S.	df	M.S.	F	P
Between	2.383	2	1.192	2.578	n.s.
Within	24.960	54	0.462		

Group II

Source	S.S.	df	M.S.	F	P
Between	2.821	2	1.411	2.538	n.s.
Within	33.350	60	0.556		

TABLE XVI

Analysis of Variance for Oral Transfer of Training as a Function of Mode of Presentation - Grade IV

Group I

Source	S.S.	df	M.S.	F	P
Between	0.154	2	0.077	0.015	n.s.
Within	26.808	51	0.526		

Group II

Source	S.S.	df	M.S.	F	P
Between	0.463	2	0.232	0.463	n.s.
Within	29.988	60	0.450		

Of the thirty-two analyses of variance presented in Tables 1 - XVI only two were significant as has been noted above. In the second grade, Group I (initial order of presentation: audio, print, audio-print) achievement on the oral test of achievement differed significantly as a function of mode of presentation. To determine which mode differed significantly from the others, t-tests were done to compare the scores from each mode with the scores from every other mode. The analysis is given in Table XVII from which it will be seen that, for this one group, achievement on the oral test was highest on words learned through the audio channel.

TABLE XVII

Comparisons Between Individual Modes of Presentation for Group I, Grade II - Oral Achievement

Groups	N	ΣX	ΣX^2	$\bar{X}$	σ
Audio	24	120	828	5.00	3.148
Print	24	61	383	2.542	3.148
Audio-Print	24	73	373	3.042	2.562

$t_{A - P} = 2.704, \quad p < .01$

$t_{A - AP} = 2.365, \quad p < .05$

$t_{P - AP} = 0.604, \quad p > .05$

Also, in the second grade, Group II (initial order of presentation: print, audio, audio-print), differed in delayed transfer of training as a function of mode of presentation. To determine which mode differed significantly from the others, t-tests were

done to compare the scores from each mode with the scores from every other mode. The analysis is given in Table XVIII from which it will be seen that, for this one group, delayed transfer was significantly better for audio alone than for audio-print and for print alone than for audio-print; however, a comparison between audio alone and print alone did not differ significantly.

TABLE XVIII

Comparisons Between Individual Modes of Presentation for Group II, Grade II - Delayed Transfer of Training

Groups	N	ΣX	ΣX^2	$\bar{X}$	σ
Audio	21	29.766	53	1.417	0.735
Print	21	35.756	72	1.703	0.745
Audio-Print	21	17.860	29	0.850	0.832

$\underline{t}_{A - P} = 1.252, \quad p > .05$

$\underline{t}_{A - AP} = 2.380, \quad p < .05$

$\underline{t}_{P - AP} = 3.500, \quad p < .01$

One of the limitations of group analysis is the possibility that the failure to obtain group differences may cause one to erroneously infer that the manipulated variables did not have a significant effect on individual achievement.[1] Because this study was concerned with not only the effects of modes of instruction on

[1] A counterbalancing effect of the modes of instruction may occur, thus reducing overall differences between the means of the groups.

group achievement but also individual achievement, further analyses were completed. Specifically, a frequency count was completed in which students were classified according to the mode of instruction on which they achieved the highest score. Mean I.Q. and Reading Comprehension scores were then computed for each classification. The results of this classification for the respective grade levels are presented in Table XIX.

TABLE XIX

Second Grade - Written and Oral Achievement Combined

Highest Score	N	Mean I.Q.	Mean R.C.	Mean Total Ach.
Audio	13	106.000	57.154	17.462
Print	13	109.692	62.000	21.231
Audio-Print	5	114.200	68.800	37.600
A + Print	2	99.000	56.500	16.000
A + AP	3	98.667	53.000	13.667
V + AP	2	105.500	59.000	29.000
A + V + AP	2	114.500	69.500	28.500
Total	40	107.725	60.550	21.975

Fourth Grade - Written and Oral Achievement Combined

Highest Score	N	Mean I.Q.	Mean R.C.	Mean Total Ach.
Audio	11	102.818	50.909	11.091
Print	9	108.111	52.222	8.889
Audio-Print	7	117.429	58.286	22.857
A + Print	1	110.000	51.000	17.000
A + Print	0	---	---	---
V + AP	4	108.750	56.500	13.000
A + V + AP	7	93.714	33.714	3.000
Total	39	105.821	50.026	11.590

From these results it can be inferred that mode of presentation, while not affecting group means significantly, did affect the achievement of the individual. Inspection of the data indicates that in both the second and fourth grade populations, Ss who achieved best with audio presentation had the lowest I.Q. and lowest Reading Comprehension scores of the three groups, while Ss who did best using the audio-print combination had the highest I.Q. and Reading Comprehension scores. The Ss who achieved best on the visual material had I.Q. and Reading Comprehension scores somewhat less than the audio-print group and somewhat more than the audio Ss.

Mode of Presentation: Error Rates

The error rates for each programmed unit for each group in the second grade are presented in Table XX and for the fourth grade in Table XXI. It is apparent that nearly all of the error rates are much higher than is considered acceptable for commercial programs. Since the error rates obtained on the programs during development were under 10 per cent, one must conclude that group presentation by overhead projector and by audio tape significantly increased the difficulty of the learning tasks and placed a limit on the level of achievement.

Comparison of the error rates in Table XX for the print form and the audio form reveals that the error rate for the audio form was consistently lower than the rate for the print forms. It will be recalled that Group I and Group II worked through eight of the units, and since Ss were randomly assigned to groups, the comparison of print with audio is legitimate. The error rates in Table XXI for the fourth grade show the same trend but they are not entirely con-

TABLE XX

Error Rates (in per cent) X Unit X Mode of Presentation - Grade 2

Unit	Print	Audio	Audio-Print
1	24	7	
2	47	9	
3			9
4	37	7	
5	26	17	
6			44
7	24	15	
8	56	33	
9			15
10	33	15	
11	9	2	
12			22

SECOND GRADE
50% less than 10% on audio
19% less than 10% on print

TABLE XXI

Error Rates (in per cent) X Unit X Mode of Presentation - Grade 4

Unit	Print	Audio	Audio-Print
1	49	47	
2	51	32	
3			24
4	38	25	
5	26	29	
6			9
7	26	14	
8	32	22	
9			21
10	20	11	
11	25	16	
12			27

FOURTH GRADE
22% less than 10% on audio
7% less than 10% on print

sistent (see rates for Unit 5) nor are the differences nearly as large in most instances.

In the second grade, fifty per cent of Ss had error rates on the audio form of less than 10 per cent but only nineteen per cent had error rates of less than 10 per cent on the print form. In the fourth grade, twenty-two per cent of Ss had error rates of less than 10 per cent on the audio form while only 7 per cent had less than a 10 per cent rate on the print form.

For grade two, then, the lowest mean error rate was obtained on the audio format while the highest rate was obtained on the print format. On the other hand, in grade four, the lowest error rate was obtained for the audio-print combination but the highest rate also was obtained on the print format.

Mode of Presentation: Student Preferences

A preference scale (Appendix D) was given to all Ss at the end of the study to determine preference for mode of presentation. The per cent of Ss in each grade who preferred each mode is presented in Table XXII. It is interesting to note that no S in either grade preferred the print mode. For grade two, the order of preference was: teacher, audio-print, audio, print. The order does not agree closely with relative achievement by mode, since the highest achievement occurred for the audio mode and the lowest for the audio-print mode; however, it does agree reasonably directly with error rate.

For grade four, the order of preference was: audio-print, teacher, audio, print which agrees directly with the order of achievement on the three programmed formats and with error rate.

A summary of the rank order for achievement, preference, and

error rate as a function of mode of instruction is given in Table XXIII.

TABLE XXII

Preferences of Second and Fourth Grade Students for Four Modes of Presentation (In per cent)

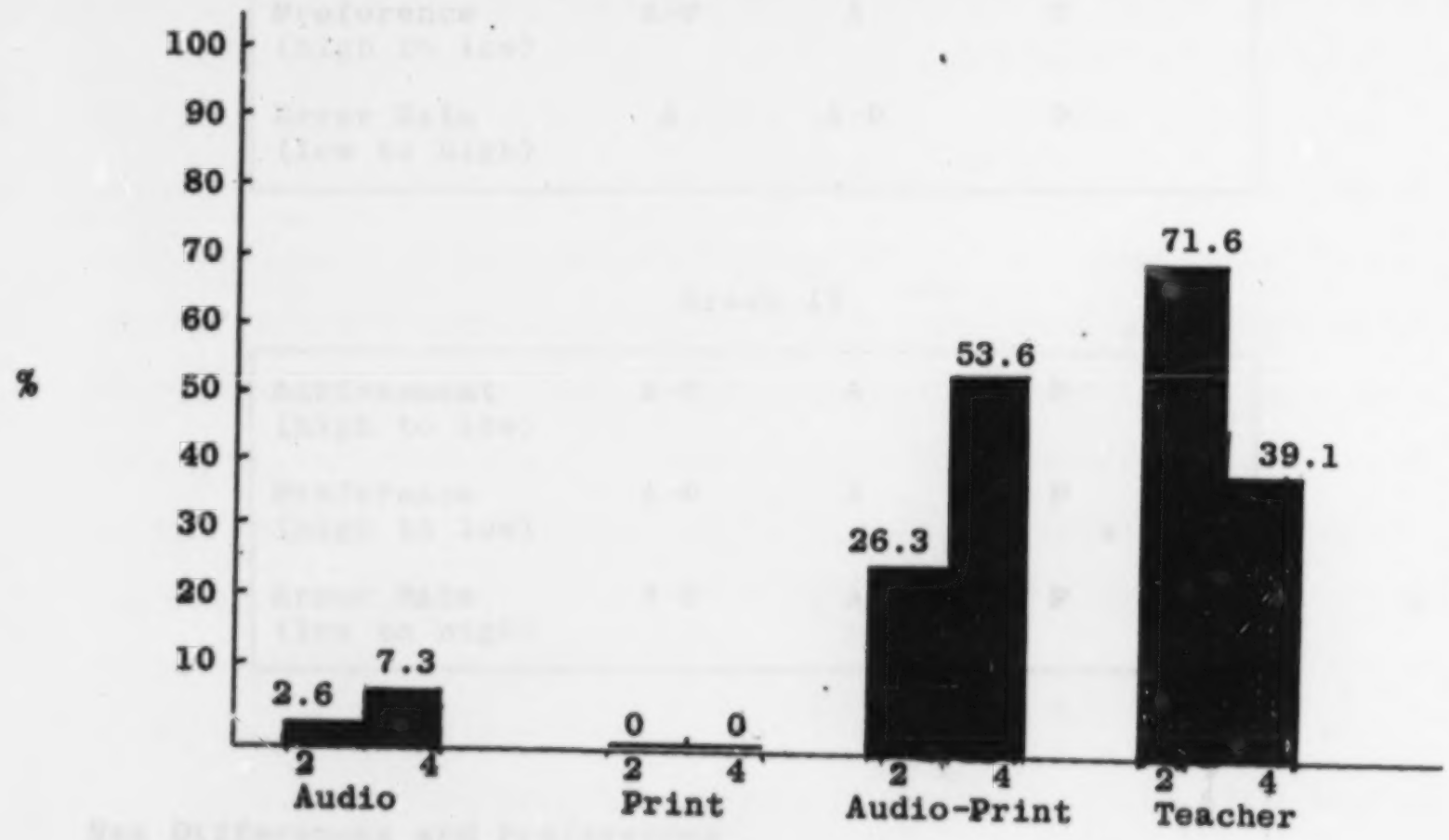

TABLE XXIII

Order of Achievement, of Preference and of Error Rate as a Function of Mode of Presentation

Grade II

Achievement (high to low)	A	P	A-P
Preference (high to low)	A-P	A	P
Error Rate (low to high)	A	A-P	P

Grade IV

Achievement (high to low)	A-P	A	P
Preference (high to low)	A-P	A	P
Error Rate (low to high)	A-P	A	P

Sex Differences and Preferences

Chi square tables (2 x 2) were constructed to compare males and females in each grade on all possible combinations of the four modes of presentation presented in the preference schedule, viz. teacher, audio, print, and audio-print. No statistically significant differences were obtained from any of the six comparisons for each grade.

Error Rate, Intelligence, and Preference

To determine whether or not either error rate or I.Q. was related to preference for teacher versus preference for the three

programmed modes, point biserial correlations were computed. None of the correlations approached significance indicating that prediction of preference for mode could not be made from a knowledge of I.Q. or error rate.

III. DISCUSSION

I. Are two channels (print + audio) more effective in learning spelling than print alone or audio alone? The data analysis for groups in both grade two and grade four resulted in non-significant differences, with one exception; therefore, no support was found for Hartman's hypothesis (1961a, p.25) that "Redundant information simultaneously presented by audio and print channels is more effective in producing learning than is the same information in either channel alone." The one exception (Table XVII) was Group I, second grade, a group which received the audio format initially and which achieved significantly more from the audio channel than from print or audio-print.

No support was found in either grade for the effectiveness of two channels over one, either audio or print, (1) in increasing the amount retained, or (2) in improving oral transfer of training. Again, with only one exception, no effects of mode of presentation were found on a test of delayed transfer of training. The exception (Table XVIII), which occurred in Group II, second grade, favored both the audio mode and the print mode over the simultaneous presentation of the two modes.

The failure to find differences of practical consequences may be valid. On the other hand, several limitations on the findings of this study were implied in the presentation of the results.

First, the learning task was very difficult, both for the second grade and the fourth grade; hence, underlearning rather than over-learning of most of the words seems highly probable. Second, group pacing of programmed material at these grade levels greatly increased the error rates over those obtained in individual pacing. Since error rate and achievement tend to correlate moderately, it seems probable that intervals of time permitted for each frame served to limit severely the achievement of some Ss, particularly for the print mode in grade two in which reading ability is limited.

Mode of presentation, while tending not to affect group means for achievement, did affect the achievement of individual Ss as noted in Table XIX. These findings support the oft-stated view that no single mode of instruction (or channel of communication) is equally appropriate for all learners. When reading comprehension and intelligence are below average, it is not surprising to find the audio-channel better than the print channel. On the other hand, the finding that those who learned more from the two channel presentation were above average in intelligence and reading comprehension is not quite as obvious. These findings suggest that there may be an interaction between mode of instruction and intelligence and reading comprehension. Further, they may suggest that learning from two channels simultaneously presented is more challenging; hence, more motivating to young Ss who are bright and who read well.

II. What are the relationships between preference for mode of presentation, level of achievement, and error rates? Second graders were not particularly consistent between preference for mode, achievement and rate of error. It was found that in grade

two, even though least was learned via two channel presentation, it was the most highly preferred of the three programmed modes of presentation (Table XXIII); however, the number who expressed a preference for human teacher was more than double that preferring audio-print. The preference data were obtained through the pair-comparison method, a forced-choice technique, hence, each S was required to choose between teacher and each other mode.

The relationship among the three variables was entirely consistent in grade four. Subjects preferred the programmed mode on which the lowest error rate occurred and from which the most learning occurred. Interestingly enough, fourth graders preferred the two channel, programmed presentation over the teacher. Perhaps, Ss at this grade level are more adaptable to non-teacher directed learning situations.

Finally, it needs to be noted that of the three programmed modes, audio-print was most preferred and the print mode was least preferred. This suggests strongly that programmed spelling should not be presented exclusively by a print mode.

IV. SUMMARY

The purpose of the study was a comparison of the effectiveness of programmed two channel presentation (audio plus print), with programmed one channel presentation, audio only or print only, in teaching spelling at two elementary grade levels.

Sixty Ss in grade two and 64 Ss in grade four were taught 20 spelling words through programmed material presented for group pacing via overhead projector, 20 spelling words via audio tape recorder, and 20 spelling words via simultaneous presentation of

audio and print modes. Each S served as his own control, hence, received training on all sixty words and in all three modes. Tests of achievement, of retention, of oral transfer of training and of delayed transfer of training were administered as was a schedule for preference for mode of presentation.

The findings were:

1. In general, no support was found for the effectiveness of one channel over the other, either in achievement, in retention, or in transfer of training.
2. Analyses of individual performance, as contrasted with group performance suggest a relationship between intelligence, reading comprehension and relative achievement among modes of presentation.
3. No S preferred the print mode and in both grade two and grade four, the simultaneous presentation of audio-print was preferred over either of the other modes of presenting programmed material. Learning spelling from a human teacher was most preferred in grade two, but it followed the audio-print mode in grade four.

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A P P E N D I X A

PHONETIC PRINCIPLE AND WORDS

TAUGHT BY EXPERIMENTAL SESSION

2nd GRADE

Experimental Session	Phonetic Principle
1	Long i followed by ght
2	Medial double consonant
3	Long a sound
4	Two vowels together; first vowel long, second vowel short
5	er ending
6	ə sound of beginning a
7	Z sound of s
8	ing ending
9	short i sound
10	short i sound of final y
11	long i sound of final y
12	short u sound

Experimental Session	Words Used
1	right, might, light, fight, bright
2	kitten, supper, suppose, better, rabbit
3	face, cage, place, table, wait
4	clean, each, real, leave, meat
5	river, flower, answer, never, winter
6	afraid, again, arithmetic, another, across
7	miles, use, rose, clothes, those
8	anything, everything, nothing, spelling, spring
9	swim, dish, since, sick, stick
10	sorry, early, lady, study, ready
11	cry, dry, sky, try, why
12	hundred, hunt, uncle, until, lunch

4th GRADE

Experimental Session	Phonetic Principle
1	ə sound of ou
2	Z sound of s
3	k sound of c
4	ə sound of io
5	s sound of c
6	ə sound of beginning a
7	medial double consonant
8	short i sound of final y
9	two vowels together; first vowel long, second vowel short
10	silent initial consonant
11	s sound of s
12	j sound of g

Experimental Session	Words Used
1	famous, serious, ambitious, ridiculous, jealousy
2	desire, designer, museums, arouse, occasionally
3	courage, cathedrals, include, helicopter, encourage
4	position, education, collections, foundation, permission
5	received, distance, absence, appearance, certain
6	allow, attend, arrive, attack, accompany
7	commenced, command, college, balloon, stubborn
8	primary, scenery, century, memory, boundary
9	increase, succeed, conceit, deceive, perceive
10	honors, wrapped, knowledge, wholly, heir
11	purse, disgrace, distinct, satisfied, disappear
12	gentleman, regions, passenger, geniuses, imagine

A P P E N D I X B

ACHIEVEMENT TESTS

Spelling Achievement Test - 4th Grade
Print Form

1. "A large bag filled with gas, which floats in the air", may be called a b_____.

   When Alex blew too much air in his b_____, it broke. _____

2. A word which means "began" or "started" is c_____.

   The play c_____ at eight o'clock in the evening. _____

3. A b_____ is "a limiting line or anything that limits".

   A river was the b_____ between the two countries. _____

4. The word s_____ is used to talk about "the landscape or the general appearance of a country side".

   Tom likes mountain s_____ very much. _____

5. The word p_____ describes "a person's standing or rating in a group".

   Mr. Brown received a better p_____ with his company. _____

6. A word which means "add to or make greater" is i_____. _____

7. "To do well or to gain something that you try for" is to s_____.

   If she works hard, Mary will s_____ in becoming a good student. _____

8. A word which means to "understand through one's senses or in one's mind" is p_____.

   Did you p_____ the beauty of the sunset? _____

9. If something has "the quality of being silly or laughable", it is r_____.

   The clown looked r_____ with his big nose. _____

10. "Awards made for glory, fame or high achievements" are called h_____.

    John Glenn has received many h_____ from the people of the United States. _____

11. "That which a person knows or has learned" is called k_____.

    Bill has much k_____ about animals. _____

12. "A person who inherits something or who gets property from someone who has died" is an h_____.

    Prince Charles is Queen Elizabeth's h_____. _____

13. If you "want or wish for something very much", you d_____ it.

    A famous man once said, "The thing I d_____ most is freedom." _____

14. A word which is defined as "sure, fixed, or settled" is c_____.

    Jim is c_____ that he passed the arithmetic test. _____

15. A word whose definition is "being away or the time of not being present" is a_____.

    Ann came back to school after an a_____ of two weeks. _____

16. If you "go to or are present" at something, you a_____ it.

    John and Ann want to a_____ the movie next week. _____

17. "To let or to permit something" means to a_____ it.

    Will your mother a_____ you to go swimming? _____

18. "A place of higher learning" is not a high school, but a c_____.

    Bucknell is a c_____ that is near you. _____

19. If you "have strong desires for fame or honor", you are a_____.

    John works hard because he is a very a_____ boy. _____

20. The word f_____ means "well known or much talked about".

    George Washington is one of our most f_____ presidents. _____

21. A word which means "to excite or to stir up" is a_____.

    Paul Revere wanted to a_____ the colonists by his ride. _____

22. "An airplane whose propellers are on the top" is a h_____.

    President Kennedy has his own h_____. _____

23. "Large and important churches" are called c_____.

    There are several famous c_____ in Italy. _____

24. The word i_____ means "to have as part of or to make a part of."

    Our class trip will i_____ a visit to Washington, D.C. _____

25. "Groups of objects which have been brought together in one place" are c_____.

    Several of the fourth grade boys had stamp c_____. _____

26. "Schooling or the process of learning through study" is called e_____.

    You are getting your e_____ in a free public school. _____

27. If a person is in "a state of dishonor or shame", he is in d_____.

    To be put in jail usually brings d_____ to a man and his family. _____

28. "To pass from sight or to be lost" means to d_____.

    The magician made the rabbit d_____. _____

29. "People who are brilliant or have great natural ability" are called g_____.

    Leonardo de Vinci was one of the g_____ of seventeenth century in Italy. _____

30. "Large divisions of land or parts of the world" are called r_____.

    The r_____ of the earth near the equator are hot. _____

Spelling Achievement Test - 4th Grade
Audio Form

conceit	A word which says that a person has too high an opinion of himself is conceit.
serious	If a person is "earnest, thoughtful, and solemn", he is serious.
designer	A person who "designs or makes plans" is a designer.
foundation	The word which describes "anything upon which you could build" is foundation.
appearance	The word appearance means "the act of coming into sight or a person's outward look".
stubborn	If someone is "difficult to handle or hard to deal with", he is stubborn.
wholly	A word which means "completely, entirely" is wholly.
passenger	"A person who travels in a car, airplane, train, bus, or other vehicle" is called a passenger.
purse	A handbag or a container for money and cosmetics is called a purse.
deceive	A person is trying to deceive another person if he misleads or cheats him.
occasionally	When something happens every now and then, it is occurring occasionally.
encourage	A word which means "to give hope, courage, or confidence to" is encourage.
distance	A word meaning "the space between two places" is distance.
accompanied	If a person has "gone along with someone" he has accompanied him.
command	If a person is "in charge or in control" he is in command.
primary	A word which describes "something that is first in importance" is the word, primary.
district	"A division of territory for political purposes or a certain region or locality" is called a district.
imagine	The word imagine means "to assume or suppose or form a mental picture of".
jealousy	If you "dislike or fear or envy rivals", you have jealousy.

museums	"Buildings in which objects of art and history are exhibited" are called <u>museums</u>.
courage	If a person has "bravery or valor", he has <u>courage</u>.
received	The word <u>received</u> means "accepted or took what was offered".
permission	If a person has a "consent or authorization", he has <u>permission</u>.
attack	When you "begin a fight or battle by using force", you <u>attack</u>.
arrive	A word which means to "reach a place" is <u>arrive</u>.
century	A "period of one hundred years" is called a <u>century</u>.
memory	That which is remembered is stored in a person's <u>memory</u>.
satisfied	A word meaning "content, happy" is <u>satisfied</u>.
wrapped	A word which means "enclosed or bound" is <u>wrapped</u>.
gentleman	A man who is "well-bred and has good manners" is a <u>gentleman</u>.

Spelling Achievement Test - 2nd Grade
Print Form

1. The word u_____ means "up to the time of."

   "I may play at your house u_____ lunch time," Judy told Jane. _____

2. The word m_____ means "great power or great strength."

   John tried to lift the log with all of his m_____. _____

3. The opposite of "dark" is l_____.

   We get l_____ from the sun. _____

4. "To go away from" is to l_____.

   Judy had to l_____ the party before I did. _____

5. "To stay till someone comes or something happens" is to w_____.

   Jim asked Bill to w_____ for him after school. _____

6. A place made of wire, or wood and bars in which animals or birds are kept is called a c_____.

   The lion was in a large c_____. _____

7. The things which people wear are called their c_____.

   When Jack fell in the river, his c_____ got wet. _____

8. "Anything on which food is placed, such as a plate, platter, or bowl" is called a d_____.

   Grandma put the cookies on a pretty d_____. _____

9. The word a_____ means "a thing of any kind."

   Miss Brown said, "Do not write a_____ on your papers until I tell you to." _____

10. "Ill, in poor health, or having some disease" is the meaning for the word s_____.

    Alice was s_____, but now she is well. _____

11. A pretty, red or white or yellow sweet-smelling flower which grows on bushes is the r_____. _____

12. When you study about numbers, doing problems, you are studying a_____.

    Which do you like better, reading or a_____? _____

13. A large flowing body of water is called a r_____.

    The boys liked to swim in the Mississippi r_____. _____

14. If something is "not wet or without water", it is d_____.

    Mother said, "Take those wet clothes off and put these d_____ ones on." _____

15. The opposite of "late" is e_____.

    We started for school e_____ so that we would not be late. _____

16. The meal which is eaten at noon is usually called l_____.

    Bob eats his l_____ at school. _____

17. A baby cat is a k_____.

    The mother cat washed the k_____. _____

18. The opposite of "left" is r_____.

    Alex writes with his r_____ hand. _____

19. The animal flesh that is used for food is called m_____.

    Ham is the m_____ that I like best. _____

20. If something is "true, not made up, or not a fake", it is r_____.

    Mother's ring was a r_____ pearl. _____

21. "The part of space where something is" is called a p_____.

    New York is the p_____ that I want to visit. _____

22. We use these words to talk about good things: good, b_____, best.

    Alice got b_____ marks in arithmetic this year. _____

23. The word which means "from then till now" is s_____.

    I have not seen Uncle Jack s_____ Christmas. _____

24. "Writing or saying the letters of words in correct order" is called s_____.

    Ten children got all of the words right on the s_____ test. _____

25. "If you are sad about something or sad for someone," you are s_____.

    Betty was s_____ that she had broken her mother's dish. _____

26. When you talk about things near you, you use "these", and when you talk about things farther away, you use "t_____".

    These are my books.
    T_____ are John's books. _____

27. The word a_____ means "one more" or "a different one".

    Jim lost his baseball, but Dad got him a _____ one. _____

28. A reply to a question is an a_____.

    Bob gave the right a_____ to the question. _____

29. "For what reason?" is the meaning of the word w_____.

    W_____ is the sky blue? _____

30. "A polite term for a woman" is the word l_____.

    The gentleman and the l_____ went to the opera. _____

Spelling Achievement Test - 2nd Grade
Audio Form

bright	The word bright means a person who is "very smart" or something which is "filled with light".
rabbit	A fuzzy animal with long ears and a little soft tail is a rabbit.
table	We eat on a table.
flower	The part of a plant which blooms into color and smells nice is called the flower.
fight	A word which means "battle or struggle" is fight.
again	"To repeat another time" is the meaning of the word again.
everything	A word which means "the total or all" is everything.
stick	A piece of wood, cut or broken from a tree, is called a stick.
try	If you make an effort to do a thing, you try.
supper	The evening meal is called supper.
study	When you try to learn a lesson, you study it.
afraid	The word afraid means "to have fear".
nothing	"Not anything" or "something of no importance" both are meanings of the word nothing.
across	"On the other side of" is a meaning for the word across.
suppose	If you think something may be possible, you suppose.
spring	The time of year when the trees form buds and the flowers come to life is called spring.
swim	When you move through the water without touching the ground, you swim.
miles	How fast a person goes in a car is measured in miles per hour.
use	A word which means "to put into service" is use.
each	A word which means "every or apiece" is each.
winter	The coldest season of the year is winter.

clean	To get rid of dust and dirt means to clean.
face	The front part of a person's head, having two eyes, a nose, and a mouth, is called a face.
ready	"To be prepared for something" means to be ready.
never	If you do not ever do something, you never do it, "not at any time".
cry	A short scream or a steady sobbing mean to cry.
uncle	Your mother's brother is your uncle.
sky	When we are outside and look up we see that there is a sun or moon and stars in a body we call the sky.
hunt	"To look for something and to track it down" means to hunt.
hundred	Ten times ten (or 99 plus one) makes a hundred.

A P P E N D I X C

TRANSFER TESTS

AND

TRANSFER WORDS

(arranged by concept)

TRANSFER TEST - 2nd Grade
(Oral)

knight	The knight came riding on his swift white horse to rescue the princess from the tower.
playwright	The famous playwright had many of his plays shown on Broadway.
tonight	The crickets are chirping and lightning bugs are flashing tonight.
commenced	At the school, classes commenced each morning at eight-thirty.
command	The Indian chief issued a command for John Smith to be put to death.
college	A college education helps a man to get a good job.
gray	The morning fog gave all the buildings a gray and gloomy look.
stains	The boys had stains on their hands and clothes from eating wild blackberries.
traitor	Aaron Burr was accused of being a traitor to his country.
increase	Laws protecting game have resulted in an increase in wildlife.
received	General Eisenhower received many medals for his bravery during World War II.
succeed	To succeed in getting good grades, one must work hard and be patient.
December	Christmas is celebrated in the month of December.
remember	Difficult spelling words are hard to remember.
weather	Snow and sleet are wrong kinds of weather for May.
allow	A teacher cannot allow a pupil to chew gum in class.
attend	Mary had to attend a dance school to learn ballet and tap dancing.
attack	The four dogs began to attack the alley cat.
cousin	Joe and his cousin have the same last name since their fathers are brothers.
does	Jim does all his homework and receives good grades.

these	<u>These</u> pencils need to be sharpened; those were already done.
something	<u>Something</u> that every boy and girl wants is a bicycle.
Thanksgiving	Turkey and pumpkin pie are part of most <u>Thanksgiving</u> dinners.
swimming	Rivers, lakes, and pools are all good places for <u>swimming</u> on hot summer days.
carry	Tom helped his mother <u>carry</u> the groceries home from the store.
fairy	Tinker Bell is a little <u>fairy</u> who helps Peter Pan.
party	Nancy had a puppet show at her birthday <u>party</u>.
which	Jimmy could not decide <u>which</u> one of the puppies he wanted.
robin	A cheery sign of spring is the <u>robin</u> red breast.
window	When Nancy was sick, she had to watch the children play from her <u>window</u>.
defy	Billy tried to <u>defy</u> his mother by eating a forbidden candy bar.
modify	The rough little boy should <u>modify</u> his bad speech and manners.
fry	Mother is going to <u>fry</u> some bacon and pancakes.
abrupt	When Jim's mother asked the children to clean up the mess, their fun came to an <u>abrupt</u> end.
abundance	American children have an <u>abundance</u> of food and clothing that many children overseas do not have.
hulk	The <u>hulk</u> of the ship was decayed and falling apart.

TRANSFER TEST - 4th Grade
(Oral)

disastrous	The <u>disastrous</u> hurricane tore the roofs off homes in four Florida towns.
beauteous	The velvet-like green hills sprinkled with violets presented a <u>beauteous</u> scene.
conscious	Tom made a <u>conscious</u> effort to appear well-mannered to his mother's guests.
Asiatic	Several exchange students from Asiatic countries are living in Pennsylvania this year.
chasm	The <u>chasm</u> in the Grand Canyon is one mile deep and two hundred and seventeen miles long.
business	After his graduation from college, the young man went into the insurance <u>business</u>.
course	The <u>course</u> of the Hudson River forms part of the New York-New Jersey state line.
secret	Daniel Boone knew that the Indians had planned a <u>secret</u> attack on the fort.
describe	The poet tried to <u>describe</u> the beauty of the changing colors of the eroded rock forms.
reduction	The use of the Salk vaccine has resulted in a <u>reduction</u> of polio cases.
obstruction	The rock was an <u>obstruction</u> to the boats which were trying to get through the channel.
calculation	The engineer made a <u>calculation</u> as to how much weight the bridge could hold.
citizens	The <u>citizens</u> of the community worked together to make a park for their children.
excellent	Milk contains so many vitamins that it is an <u>excellent</u> health food.
medicine	The doctor left the sick boy's <u>medicine</u> by his bed.
aware	The girl was not <u>aware</u> that a car was coming until it hit her.
appreciate	Children should <u>appreciate</u> the opportunity for good education which they get in this country.
accumulate	Benjamin Franklin's goal in life was not to <u>accumulate</u> wealth, but wisdom.

supplies	The white traders purchased fresh <u>supplies</u> from the friendly Indians.
brilliant	Albert Einstein introduced many <u>brilliant</u> scientific theories.
billiards	A game played by two or more players with cues and ivory balls on a table is called <u>billiards</u>.
truly	A polite means of closing a letter is by saying, "Yours <u>truly</u>".
enemy	The soldiers glided through the jungle fearing that they might meet the <u>enemy</u> unexpectedly.
necessary	In a democracy it is <u>necessary</u> to divide the ruling power into three parts.
beseige	The four brave soldiers tried to <u>beseige</u> the enemy fort with guns and grenades.
decrease	Research and testing has helped provide the means to <u>decrease</u> communicable diseases.
receipt	John asked for a <u>receipt</u> to show that he had paid the electric bill.
psychology	A study of the science of human behavior is called <u>psychology</u>.
ptomaine	Rotting animals produce a nitrogen substance which results in <u>ptomaine</u> poisoning.
pseudonym	Many writers want to remain anonymous so they sign their work with a <u>pseudonym</u>.
several	<u>Several</u> types of small dogs are poodles, spaniels, and terriers.
southern	The <u>southern</u> climate is hot and humid with very little snow in the winter.
soldiers	There are many American <u>soldiers</u> now fighting in Laos.
intangible	The best things in life are not material like money and jewels but <u>intangible</u> like love and honor.
rigid	If parents have too <u>rigid</u> rules, their children may rebel and get into serious trouble.
frigid	The Eskimos live in a very <u>frigid</u> climate.

TRANSFER WORDS - 2nd Grade
(by concept)

I. long i
<u>followed by ght</u>

knight
tonight
playwright

II. medial
<u>double consonant</u>

commenced
command
college

III. <u>long a sound</u>

gray
stains
traitor

IV. long vowel (ē) by
<u>two vowels together</u>

increase
received
succeed

V. <u>er ending</u>

December
remember
weather

VI. ə sound of
<u>beginning a</u>

allow
attend
attack

VII. <u>z sound of s</u>

cousin
does
these

VIII. <u>ing ending</u>

something
Thanksgiving
swimming

IX. <u>short i sound of final y</u>

carry
fairy
party

X. <u>short i sound</u>

which
robin
window

XI. <u>long i sound of final y</u>

defy
modify
fry

XII. <u>short u sound</u>

abrupt
abundance
hulk

TRANSFER WORDS - 4th Grade

disastrous
beauteous
conscious
Asiatic
chasm
business
course
secret
describe
reduction
obstruction
calculation
citizens
excellent
medicine
aware
appreciate
accumulate
supplies
brilliant
billiards
truly
enemy
necessary
beseige
decrease
receipt
psychology
ptomaine
pseudonym
several
southern
soldiers
intangible
rigid
frigid

A P P E N D I X D

PREFERENCE SCALE

1. Do you prefer to learn spelling with the tape recorder or with the words on the screen?

2. Do you prefer to learn spelling with the tape recorder or with the combination of tape recorder and screen?

3. Do you prefer to learn spelling with the screen or with the combination of tape recorder and screen?

4. Do you prefer to learn spelling with the tape recorder or the way your teacher teaches?

5. Do you prefer to learn spelling with the screen or the way your teacher teaches?

6. Do you prefer to learn spelling with the combination of tape recorder and screen or the way your teacher teaches?